

ISO 15339 Reference Printing Conditions

David Q. McDowell
Penfield, NY, USA
mcdowell@npes.org



Some Background

- Standards for the printing and publishing industry initially started in early 1980's
- First standards were file exchange formats for digital data.
- However, unless the meaning of the data could be defined, it did not make sense to exchange data.
- Key issue in defining the meaning of the data is the definition of printing aims.



First printing definition standards

- ISO 12647, *Graphic technology - Process control for the manufacture of half-tone colour separations, proof and production prints*
- Started in ISO TC130 in 1991 (first part published 1996)
- Process control aims
 - Colour of the solids and 2-colour overprints
 - TVI and Grey balance
 - Tone value sum
 - Substrate (colour and gramage)
- Initially based on film workflow but evolved to include digital data.



First printing definition standards

- ISO 12647
 - Part 1: Parameters and measurement methods
 - Part 2: Offset lithographic processes
 - Part 3: Coldset offset lithography on newsprint
 - Part 4: Publication gravure printing
 - Part 5: Screen printing
 - Part 6: Flexographic printing
- Last revision published in 2007
- Represented a major step forward in definition of printing aims for the industry



ISO 12647 – How used?

- Designer/client picks printing condition from ISO 12647 based on paper and process to be used
- Validation prints and proofs based on aims of ISO 12647 as interpreted by characterization data sets from various trade groups.
- Calibrate press to achieve solids and TVI for printing condition of ISO 12647
- Produce OK print
- Print
- While printing verify that solids and TVI are within variation tolerances of ISO 12647



Printing in 2011

- The full potential of color management and reference printing conditions cannot be realized by further adapting 12647.
- ISO 15339 (in development) represents a new approach to printing definition based on digital data and color management.
- ISO 15339 complements ISO 12647-2. Together they allow the Graphic Arts Industry to transition from the technologies of the 1990's to the technologies of the 2010's



What is ISO 15339

- ISO 15339-1, *Graphic technology — Printing from digital data — Part 1: Basic principles* (current title) **OR**
ISO 15339-1, *Graphic technology — Printing from digital data across multiple technologies — Part 1: Principles and reference printing conditions* (one proposed title)
- Uses reference characterization data to define printing aims.
- Assumes all printing is from digital data and that digital data manipulation and colour management can be used to adjust content data to press conditions.



ISO 15339 – Principles

- Based on 7 sets of characterization data/reference printing conditions (RPC)
- Each RPC has a different gamut
- Is process independent (same RPC can be used for different printing processes – offset, gravure, flexo, etc.)
- Assumes that one of methods of ISO TS 10128 can be used to adjust data so that printing & data modification will enable printed sheet to match characterization data
- Provides adjustment of aims for substrate colour changes at same basic gamut



ISO 15339 – How used?

- Designer selects RPC to be used for the job (available options defined by expected substrate and printing process).
- Job created based on available gamut and RPC (validation print based on characterization data of RPC)
- Designer/customer select substrate and printing process based on printed product requirements
- Once substrate is selected characterization data adjusted for substrate
- Contact proof and printing will be based on substrate adjusted aims
- Job goes to qualified printer



ISO 15339 – At printer

- Printer starts with a calibrated press that is able to achieve aim solids (and characterized for the substrate to be used).
- Using one of the methods of TR10128 adjust content DATA so that press plus adjusted data matches substrate adjusted characterization data
- Create **local** process control aims (gray scale, colorimetric TVI, overprint colors, job content, etc) from RPC data
- Produce OK print
- Print
- While printing verify that solids and selected process control aims stay within aim tolerances



Minor Digression

- Let's define some new concepts that represent key tools in our new printing definition approach:
 - Reference Printing Conditions (RPCs)
 - Substrate adjustment
 - ISO TS 10128



Reference Printing Condition

What is a Reference Printing Condition?

- The definition of a specific outer gamut (CBMRYGK) to be achieved and a reference tabulation of the CMYK to printed-color relationship of the within-gamut data (characterization data)
- Within-gamut data may be (usually is) for an ideal (virtual) printing system
- Used for data exchange and as the reference for printing



Substrate Adjustment

- Tristimulus Correction Technique
 - Uses CIE XYZ values of new substrate to adjust CIE XYZ values of reference characterization data to predict what same printing would be on the new substrate
 - Practical test shows it works equally well for changes in substrate resulting from a basic shade change or change in OBA level
 - May also work to correct for instrument deficiencies
 - Simple computation documented in ISO 13655
 - Provides new aims for all CMYK data points (including solids and neutrals)



ISO TS 10128

ISO TS 10128?

- A technical specification called: *Graphic technology — Methods of adjustment of the colour reproduction of a printing system to match a set of characterization data*
 - Assumes outer gamuts are correct
 - Adjusts within gamut data by one of three methods
 - Matching of tone value curves to develop 4 1-D transforms
 - Use of near-neutral scales to develop 4 1-D transforms
 - Use of CMYK to CMYK multi-dimensional transforms (colour management device link transform)
 - Can be used to support printing based on either ISO 15339 or ISO 12647



ISO 15339 RPC Characteristics

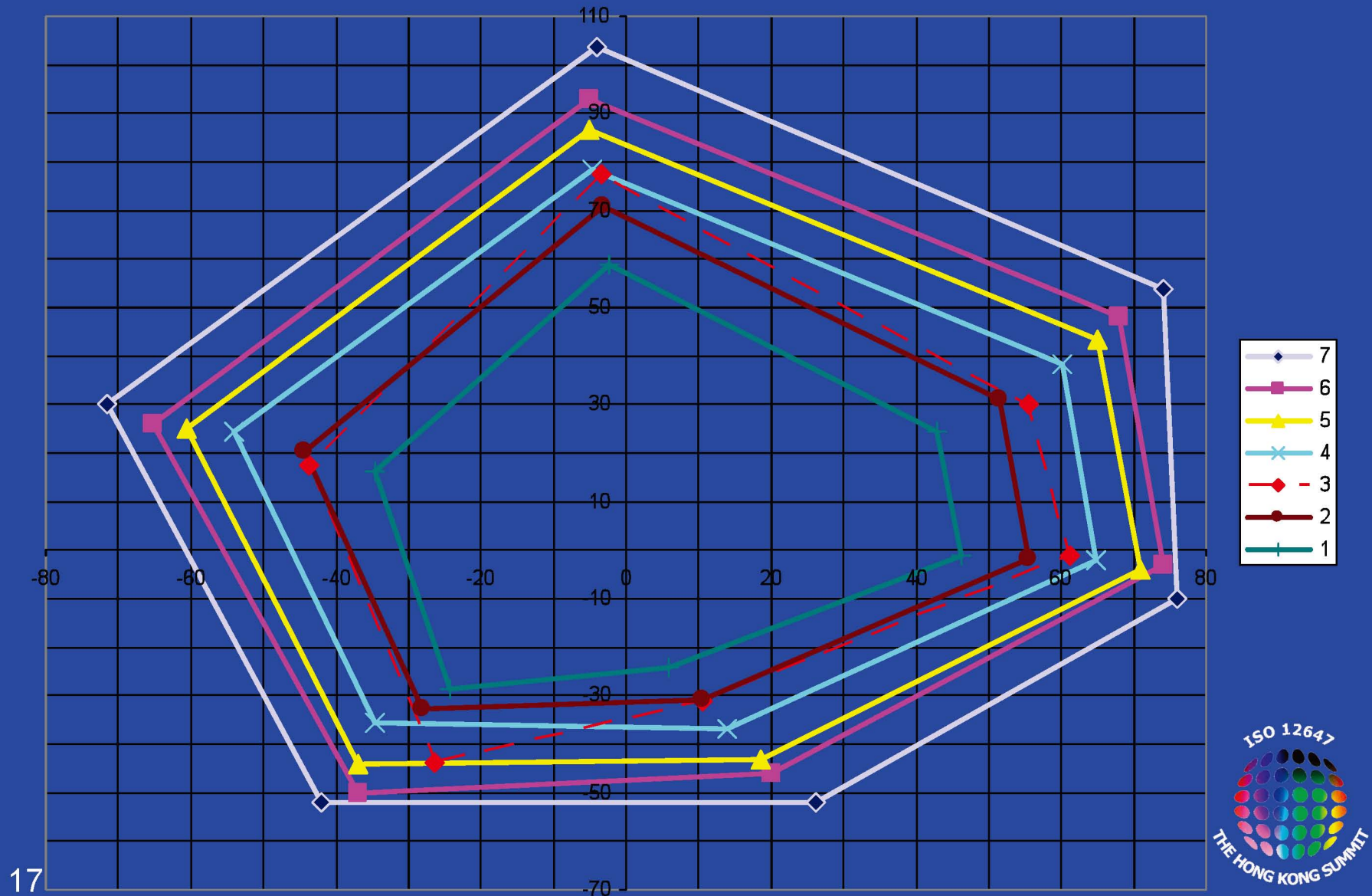
- Each reference printing condition based on different outer gamut
- Comprises a minimal set that effectively covers the range of print and paper conditions
- Represents colour reproduction of modern commercial printing that uses ISO 2846 inks
- Consistent with colorimetry of primary, two colour and three colour solids in historical press test data for various conditions (ISO 12647)
- Neutral CMY and K tonal curves that closely match each other from paper through mid-tone
- Neutral CMY and K tonal curves that each transition smoothly from mid-tone to 3c solid
- Gray balance that transitions smoothly the from paper colour to that of the 3c solid
- Represents simplified interface between prep, proofing, & printing



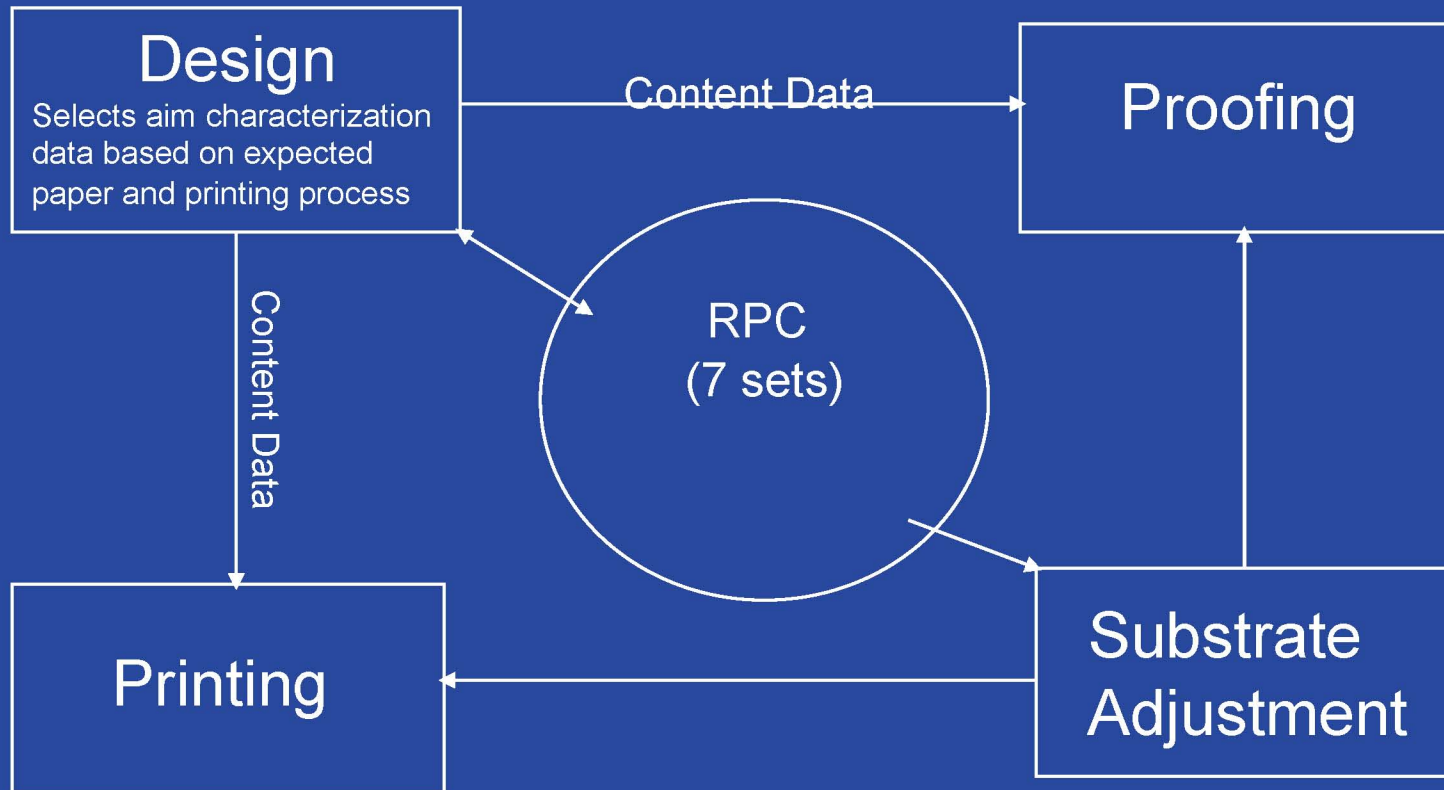
The 7 ISO 15339 RPCs

RPC	RPC name
1	ColdsetNews
2	HeatsetNews
3	PremUncoated*
4	SuperCal
5	PubCoated
6	PremCoated
7	Extra Large

What do they look like!



Workflow



Added Possibility

- Paper manufacturers (we hope) will provide cross-reference table that lists for each paper
 - Process compatibility
 - Max ISO 15339 gamut supported for each process (with standard inks)
 - Aim CIEXYZ values (white point) for each paper measured using M1 with white backing



RPCs – Where did they come from?

RPC	Name	US Reference	European Reference
1	ColdsetNews	SNAP2009	IFRA26
2	HeatsetNews	BetaHeatsetNews	Fogra42
3	PremUncoated	BetaOffsetUncoated	Fogra47
4	SuperCal	BetaSupercal	Fogra40
5	PubCoated	SWOP2006_Coated 3,5	Fogra45,46
6	PremCoated	Gracol2006_Coated 1	Fogra39
7	Extra Large	Average of digital printers	



Differences

ISO 12647 (Historically + today)

- Printing aims based on real press & real process
- Match substrate, solids, TVI, etc
- Process specific
- Largely based on process control aims

ISO 15339 (Today and into the future)

- Define color desired from printing device (Characterization data)
- Family of seven RPCs (virtual devices)
- Select aim PRC and adjust if necessary for substrate
- Match characterization data using printing device characteristics and data adjustment (ISO TS 10128)
- Process control (including aims) responsibility of printer



Is ISO 12647 Still Needed?

ABSOLUTELY

ISO 12647 represents the way many work today

- Is needed now and for some time into the future
- Needed to maintain consistency with the past
- Has many different sets of aims

ISO 15339 represents the way some people are beginning to work

- Is needed for future workflows
- Allows simplification of aims based on digital data manipulation
- Requires digital input data



Summary

ISO 12647 & ISO 15339

- Both are needed
- They compliment each other
- Industry will gradually transition from one to the other
- Some users may use both
- Different certification requirements
 - *ISO 12647: Meet process control aim values*
 - *ISO 15339: Match paper adjusted characterization*



Thank you for listening